MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1898, is based on 2,929 reports from stations occupied by regular and voluntary observers, classified as follows: 147 from Weather Bureau stations; numerous special river stations; 32 from post surgeons, received through the Surgeon General, United States Army; 2,583 from voluntary observers; 96 received through the Southern Pacific Railway Company; 13 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 31 from Canadian stations; 20 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to generally conform to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

STORM WARNINGS AND WEATHER FORECASTS.

By Lieut. Col. H. H. C. DUNWOODY, Supervising Forecast Official.

Under this head it is proposed to make note of all extreme and injurious weather conditions occurring during the month, and the warnings of the same issued by the Bureau, with instances, as far as reported by observers or the press, in which these warnings were of special public benefit. The signals displayed by the Weather Bureau will be referred to as "information," "storm," "hurricane," "cold-wave," and "norther," respectively.

The injurious conditions of note that have occurred during the month were the severe frosts of the 6th and 9th in the South Atlantic and Gulf States, the storms of the 13–15th and 18–20th in the Lake Region, and of the 26–29th on the Atlantic Coast, the severe norther of the 12–13th in California, and the flood in the middle Mississippi River.

FROSTS OF THE 6–9TH.

Heavy frosts occurred on the morning of the 6th to 9th, inclusive, in the South Atlantic and Gulf States, with light frost on the 8th as far south as Jacksonville. Warnings of these frosts were issued from the Central Office on the mornings of the 5th, 6th, and 7th, and extensively distributed throughout the regions named. The district subject to the greatest injury from frost at this time was the trucking region of North Carolina, and the following reports from the Weather Bureau officials of that region show the distribution of the warnings and their value to the interests affected.

From Mr. C. F. von Herrmann, section director, Raleigh, N. C., April 26, 1898:

Warnings were issued by telegraph from Raleigh indicating the probable occurrence of frosts on Wednesday, Thursday, and Friday mornings (April 6, 7, and 8). The number of regular display stations reached was fifty-four, of which twenty-four lie in the important eastern trucking section of North Carolina. Special warnings were also sent to eleven other points, and a number of replies to urgent inquiries by telegraph from persons not on our regular list. The warnings were also widely distributed by mail from Raleigh, Tarboro, and Parmele by the logotype system. A number of displaymen, besides posting warnings at the post office and depots, also distributed them by telephone to the principal truckers in their vicinity; they were also, where opportunity offered, sent into the country, and circulated verbally, so that, especially in the most important eastern section, they unquestionably were very widely disseminated. The average time that the warnings were received in advance of the frost was fourteen hours, amply sufficient to enable crops to be protected.

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The universal interest in the warnings is emphasized in nearly all communications received. The following typical extracts from such letters will be sufficient to convince any one on this point. Mr. H. R. Horne, of Fayetteville, writes: "Our truckers and others have shown much appreciation of these forecasts. The daily telegrams were displayed as soon as received, and telephoned to the principal truckers. The crop to which most attention has been given here and for which the warnings have been of most value is that of strawberries. The general method of protection is to cover with pine straw. The expense of covering these crops is quite an item to the truckers, and the acreage is such that it is important that the forecasts be received as early in the morning as practicable in order to give the time necessary to complete the work of protection. The only suggestion we have to offer is that in case of threatening weather forecasts be as definite as to frosts as practicable. We think that more interest is shown in the forecasts now than ever before."

Mr. W. P. Baugham, of Washington, N. C., states:

"I am glad that you wish an expression as to the value of the forecasts for the past few days. There is hardly any telling how much good we derive from them. As soon as received we notified all, in person or by telephone, and the result was that all early vegetables, garden and cold frame crops, potatoes, etc., were covered, the latter by furrows with plows. The berry crop was all covered with pine straw and saved. The saving was thousands of dollars. Please continue the service, as otherwise all of us who are interested in farming will feel like discontinuing trucking."

From Mr. W. H. Fallon, observer, Wilmington, N. C.:

No frost of consequence has occurred in this section of the State during the past season without ample warning. Upon the receipt of each warning every effort was immediately made to distribute the same to every section of eastern North Carolina by means of the telegraph, telephone, mail, bulletin, and the press. * * * We reached by telegraph as far north as Goldsboro, as far northeast as Newbern, and as far west as Hamlet and Fayetteville.

The damage done by the frost since the 1st of the month, thanks to the warnings, was nominal. From the best obtainable information $5,000 will cover it. Potatoes, beans, and peas were about all the vegetables injured, and they only slightly. It is safe to assert that at least $100,000 were saved. The following statement furnished by Mr. H. T. Bauman, shipping master of the Fruit Growers' Association, pretty well covers the case:

"WILMINGTON, N. C., *April* 14, 1898.

"The frost warnings of recent dates were received at Wilmington and vicinity from ten to twelve hours in advance of the frosts, thereby giving our truckers and strawberry growers ample time to arrange for the protection of these crops. The warnings were posted at all the principal points along the line of the several railroads, where the growers could see and profit by them. This they did by covering their plants with pine straw, which is a certain protection against cold and frost. The property protected was principally strawberries, the approximate value of which was between $600,000 and $800,000. I think it would be safe to say that the value saved through these warnings will amount to $100,000. Our growers fully appreciate this service of the Weather Bureau and your prompt dispatch of all information to the several localities in this territory."

STORMS OF 13–15TH AND 18–20TH.

Concerning these storms and the warnings issued on their account Prof. E. B. Garriott, in charge of the Weather Bureau office at Chicago, Ill., reports:

During the night of the 12–13th a storm of considerable force developed over northern Illinois. Northwest storm signals were ordered up on Lake Michigan at 9:30 a. m. on the 13th, and northeast signals at the same time on Lake Huron. High northerly winds prevailed on Lake Michigan during the 13th, and practically all vessels, except the regular liners, were unable to go northward until the morning of the 14th. On the evening of the 13th Captain Boswell of the steamship *City of Louisville* called up the Chicago office by long distance telephone from St. Joseph, Mich. With a view to making the trip over to Chicago that night he desired to ascertain the indications. He was told that the wind would haul around from east to high northerly within two hours. He afterwards stated that this information had been of great value to him, as such advice usually was. Knowing that the wind would shift to north in a short time, he was able to shape his course accordingly, escaping the severe cross sea which he would have experienced had he taken his regular course.

Another storm moved from the northwest southeastward to the Arkansas Valley from April 14 to 18, after which it took a northeasterly direction over the Lakes, attended by high winds during the 18th, 19th, 20th. Northeast storm signals were ordered up at Chicago at 10 p. m. April 17, and elsewhere on Lake Michigan on the 18th, and also on Lake Huron, except the extreme northern portion. At 9:30 a. m. on the 19th the signals were ordered up on the rest of Lake Huron and the eastern portion of Lake Superior. The display of signals continued forty-eight hours. During the gale of the 19th the steamer *J. H. Outhwaite*, towing the schooner *H. A. Barr*, became disabled on Lake Huron and both vessels were driven ashore on False Presque Isle Point. Although he had encountered the gale early in the day, the captain of the *Outhwaite* determined to press on to the Straits of Mackinac, and he believes that he would have succeeded had not his machinery become disabled. As both steamer and consort were without cargo and bound up Lake Huron, it was a most foolhardy undertaking.

STORM OF 26–29TH.

This storm developed in the Ohio Valley during the night of the 25th and moved thence to the south Atlantic Coast by the night of the 26th. It was central off the South Carolina Coast on the morning of the 27th, off the North Carolinia Coast on the morning of the 28th, and off the New England Coast on the morning of the 29th. It caused unusually severe gales and high tides on the middle Atlantic Coast, the following maximum velocities in miles per hour were reported during its progress, viz: Savannah and Charleston, 42; Wilmington, 48; Cape Henry, 68; Cape May, 40; Atlantic City, 44; New York, 36; Sandy Hook, 60; Block Island, 72; and Nantucket, 48.

Information signals for this storm were ordered from Jacksonville to Wilmington and northeast storm signals at Capes Hatteras and Henry at 10:30 p. m. of the 26th; at 10:00 a. m. of the 27th the northeast storm signals were extended to the New England Coast, all signals being well in advance of the dangerous winds. Warnings were also issued of the expected high tides, concerning which the following extract from the Norfolk Virginian and Pilot of April 28 is given:

Owing to the warnings very generally disseminated by the Weather Bureau very few were caught by the high water and little damage resulted.

FLOODS IN THE MISSISSIPPI.

The flood in the Mississippi was a continuation of that noted in the March REVIEW; the following reports from the Weather Bureau officials in the regions affected and from newspaper extracts are given:

From Mr. P. H. Smyth, observer, Cairo, Ill., May 14, 1898:

With the exception of the deplorable disaster at Shawneetown, Ill., on April 3, 1898, resulting from a break in the levee, whereby the town was inundated, 30 persons were drowned, and considerable property destroyed, the recent flood did no very great damage in the Cairo district. Railroad traffic was interrupted but very little; river navigation was practically uninterrupted; and residents of lowlands, having been amply forewarned by the Weather Bureau, removed themselves and property to places of safety, and suffered little or no loss.

The progress of the flood was carefully watched from day to day, and predictions of the stages at the several points in the Cairo section were issued when thought necessary. A detailed statement of existing river conditions was published daily on the weather map, and the maps were mailed to all points on the rivers that could be reached.

When thought necessary, forecasts were telegraphed to Evansville, Ind., Shawneetown, Ill., and Paducah, Ky.

The warnings telegraphed to the observer at Evansville were furnished the newspapers at that place, and telephoned to persons interested. The special reports telegraphed to Mr. S. A. Fowler, Paducah, Ky., were bulletined, and published in the newspapers of Paducah.

The special reports sent to Mount Vernon, Ind., and Shawneetown, Ill., were bulletined daily, and widely distributed by mail from those points. In addition to the regular river messages telegraphed daily to Evansville, Paducah, Louisville, and Chicago, special river messages were, during the period of high water, telegraphed daily to Mount Vernon, Ind., Shawneetown, Ill., Memphis, Tenn., Vicksburg, Miss., Arkansas City, Ark., and New Orleans, La.

It is safe to say that there is not a person in the threatened region but manages in some way to keep informed as to what the rivers are doing, and about how much water to expect. From the time that the river approached the danger line at Cairo until all danger was over, the office was daily visited by farmers, lumbermen, and others seeking information.

Undoubtedly the reports and warnings were of great value, and the means of saving much property. Crops did not suffer to any great extent, as the flood was not of long duration, and subsequent weather conditions were favorable. Very little planting has been done in the lower bottoms.

The river was above danger line at Evansville, Ind., from March 21 to April 12, 1898, inclusive. At Cairo the water was above danger line from March 24 to April 16, inclusive.

The predictions issued from this office in connection with this flood, were as follows:

Wednesday, March 23.—The lower Ohio will continue rising during the remainder of this week, and probably longer. At Evansville a stage of about 37 feet will be reached by Thursday morning (24th); at Paducah a stage of about 32.5 feet will be reached by Thursday morning (24th); at Cairo the danger line (40 feet) will be passed by Thursday afternoon (24th). The Mississippi from below St. Louis to Cairo will rise during the next forty-eight hours; from below Cairo to Memphis will rise for at least five days. On the morning of the 24th the stage at Evansville was 37.4 feet; at Paducah, 32.9 feet; and at Cairo, 40.9 feet.

Thursday, March 24.—The Ohio, at Evansville, will reach a stage of between 39 and 40 feet by Friday morning (25th); at Paducah, a stage of about 35 feet will be reached by Friday morning (25th); at Cairo, a stage of about 44 feet will be reached by Friday morning (25th). That part of the prediction referring to Evansville was telegraphed to the

observer at that point. The stages reached on the morning of the 25th were as follows: Evansville, 38.4 feet; Paducah, 34.4 feet; Cairo, 42.8 feet.

Friday, March 25.—The Ohio, at Evansville, will continue rising for at least three days; at Paducah and Cairo, will rise at a decreasing rate until Sunday (27th). A stage of about 35 feet will be reached at Paducah by Saturday morning (26th), and a stage of about 44 feet will be reached at Cairo by Saturday afternoon. At Paducah 35.6 feet was the stage reached on the morning of the 26th, and at Cairo a stage of 44 feet was reached by noon of the 26th (Saturday).

Sunday, March 27.—The Ohio will reach a stage of about 43 feet at Evansville Monday (28th), and 46 feet at Cairo Monday afternoon (28th). That part of the prediction referring to Evansville was telegraphed to the observer at that point. Forty-one and nine-tenths feet was reached at Evansville Monday morning (28th), and 45.9 feet at Cairo at 7 p. m. on Monday, 28th.

Monday, March 28.—The Ohio from Evansville to Cairo will continue rising. A stage of about 44 feet will be reached at Cairo by noon Wednesday, 30th. The stage at Evansville on the morning of the 30th was 43.7 feet; the stage at Cairo at noon of the 30th was 47 feet.

Tuesday, March 29.—The Ohio, at Evansville, will continue rising for three or four days, a stage of about 45 feet will be reached at Evansville by Thursday night (31st) or Friday morning (April 1); at Paducah and Cairo, will continue rising; 41 feet will be reached at Paducah by noon Wednesday (30th), and 48 feet will be reached at Cairo by Thursday noon (31st). The warning was telegraphed to Evansville and Paducah. Forty-four and seven-tenths feet was reached at Evansville on the morning of April 1; 41 feet was reached at Paducah on the morning of the 30th; and 48 feet was reached at Cairo on the afternoon of the 31st.

Thursday, March 31.—The Ohio, at Evansville, will rise slowly during the next thirty-six hours; a maximum stage of about 45 feet will be reached at Evansville on the present rise; at Paducah and Cairo will continue rising. At Cairo a stage of about 48.5 feet will be reached by Friday evening, April 1. The maximum stage reached at Evansville was 44.8 feet on the morning of April 2, the river then remaining stationary for twenty-four hours. At Cairo 48.8 feet was reached at 7:30 p. m. on April 1.

Friday, April 1.—The Ohio, at Evansville, rising slightly until to-night, very nearly stationary Saturday (2d); at Paducah, will continue rising until Sunday (3d), but at a decreasing rate; at Cairo, will rise at a decreasing rate for three or four days. The water in sight this morning indicates for Cairo a maximum stage of between 49.5 and 50 feet. The maximum stage reached at Cairo was 49.8 feet, on the morning of the 6th. The maximum stage predicted for Paducah was slightly above 46.5 feet; the maximum stage reached at Paducah was 47.3 feet.

The following are extracts from letters received at this office:

"EVANSVILLE, IND., *April* 11, 1898.

"So far as known there was not any money saving effected by these warnings, yet the citizens here have come to regard your forecasts as reliable, and many storekeepers along the river front, whose cellars were in danger of inundation, expressed themselves as much pleased with the forecast of the 29th. Much favorable comment was also made by the citizens generally regarding the correctness of the forecast."

"MOUNT VERNON, IND., *April* 19, 1898.

"In regard to benefits derived from river reports in recent floods; reports were very much sought after. We sent by mail daily about fifteen reports, and issued about fifty. Farmers from miles around made daily trips here to ascertain the stage of the water. About how much property was saved in dollars I can not state accurately, but it certainly would mount way up in the thousands. All boats were busy moving stock and people to high ground for weeks."

"PADUCAH, KY., *May* 4, 1898.

"The river reports have been of inestimable value, not only to the citizens of Paducah, but also to the timber men of the lower Tennessee and Ohio rivers, enabling them to prepare for the flood, and to remove to places of safety all goods and products. The reports sent me are each day published in the two daily afternoon papers and also in the morning daily, and through this medium reaches the entire community in a short time after receipt. The money value of stock and property saved by the reports will reach far up into the millions."

"CAIRO, ILL., *May* 13, 1898.

"The reports furnished us during the recent high water period were of great value to us at our sawmill in this county, the surrounding country sharing in the benefits. At our mill we have quite a settlement, a great many families. The warnings received gave us ample time to provide for our stock, and those in the lower lands to provide for theirs. They also guided us in floating in timber to our mill. In the vicinity of our mill there is quite a large farming country and the reports furnished at our mill have the credit of saving at least 50 acres of wheat, besides a pen of 750 bushels of corn. On the farms of Jas. Ice and Thos. Morningstar the levee broke last year, damaging at least 50 acres of growing wheat; they rebuilt the levees last fall, but not high enough. On learning the probable rise to be expected, they at once put all trams to work and built their levees high enough to keep the water from overflowing, and saved at least $1,200 to $1,500 by being warned.

"A pen of corn belonging to the Garret Bros. would have been lost had it not been for the reports sent by you.

"We call your attention to these facts which came under our direct observation, and know that the surrounding country shared equally in the benefits of the reports. Thanking you and your department for your kindness, we are, yours truly.

(Signed) SMITH BROS."

Cairo, Ill., Citizen, April 21, 1898.—The flood of 1898 is now a thing of the past. It was not so serious as that of last year in this vicinity, but from Memphis south the water reached a higher stage than last year. Owing to the excitement of war, little attention was paid to the overflow by the press or people. The river at this point was out of its banks from March 23 to April 16. The highest stage was 49.8 feet. It might be well here to state that the Weather Bureau predicted with almost perfect accuracy the maximum stage. They stated the river at Evansville would reach a maximum stage of 45 feet. It, in fact, stopped at 44.8. Here they predicted the water would come to a stand at between 49.5 and 50 feet. It stopped at 49.8 feet. These accurate predictions have increased the confidence of the public in the Weather Bureau, and the people will depend more than ever upon its warnings.

From Mr. S. C. Emery, local forecast official, Memphis, Tenn.:

During the recent high water which began in March and continued until near the end of April, the Mississippi was above the danger line in this section, as follows: Cairo, from March 24 to April 17, inclusive, and highest water, 49.8 feet; Memphis, from March 31 to April 20, highest water, 37.1 feet; and Helena, from April 6 to 24, inclusive, the highest being 49.1 feet.

During the above period most of the low lands in that portion of Arkansas comprising the county of Crittenden and the eastern half of St. Francis and Lee counties were badly flooded, as were the regions adjacent to the river on the Tennessee side in the counties of Tipton and Lauderdale. In some portions of the above area the water was higher than during any previous flood, but owing to the absence of breaks in any of the State or Government levees there was no rushing or sudden outbursts of water, but, on the contrary, the rise from first to last was steady and gradual. This being the case, ample time was afforded those living in the threatened districts to take advantage of the Weather Bureau warnings and prepare for the predicted overflow. The first regular warning issued from this office was on March 24 when the river stage at Memphis lacked 6 feet of the danger line, and this was followed by other warnings issued at intervals of four days until April 11, when the flood began to subside and all danger was past. These warnings were in the form of bulletins which gave a brief synopsis of the latest information at hand concerning the river conditions likely to affect this section, and a forecast of what might be expected in the near future. At each issue of these bulletins two hundred post offices in the threatened districts were supplied with one or more copies by mail, and the postmasters were requested to give them the widest possible circulation in their respective localities. The bulletins were also published in the daily papers. In addition to the warnings and forecasts thus issued, a daily report was furnished the local press, and the officials of the eleven railroads centering here, and by them transmitted over their respective lines for the benefit of the public.

The benefits resulting from the warnings and reports issued were pronounced, and form a striking illustration of the value of the River and Flood Service. Had it not been for the reports thus issued the levees would not have received the prompt attention needed to put them in condition to withstand the flood, and, as later events proved, they would not have been sufficient without the new work placed upon them after the overflow was predicted. The work of raising the levees was pushed forward rapidly, hundreds of men and teams being employed both night and day for about two weeks, and guards were placed along the entire line to watch for possible breaks.

Although the water in this section was higher than during the flood of 1897, or that of any previous year, and to all appearances the danger threatened was fully as great, there was no loss of life, and comparatively little damage to property, while the scenes of suffering and distress which characterized the flood of last year were entirely lacking in this. The preservation of the levees alone saved this section a sum of money more than equal to the total cost of maintaining the Weather Bureau one year. In the region unprotected by a levee the people were so well prepared for the overflow that the damage sustained was only moderate, and that mostly confined to the injury inflicted upon growing crops. Immediately upon the receipt of the information that an overflow was threatened, the people of Marion, the county seat of Crittenden County, Ark., erected a protection levee around the town, but on account of being too frail in its construction, it failed to keep out the water. There are a number of instances, however, where embankments were built around buildings and even growing crops, fully protecting them, so that flood warnings and forecasts were of especial

value to farmers and others occupying the low lands nearest the river. From these sections most of the live stock was transferred to high ground, and other movable property placed out of danger. Numerous letters have been received from the recipients of flood warnings, expressing appreciation of the Weather Bureau warnings.

NORTHER IN CALIFORNIA.

Mr. W. H. Hammon, forecast official at San Francisco, reports:

Only one injurious condition prevailed during the month, and that was the severe norther of April 12 and 13, ample warning of which was given on the morning of April 11. High desiccating north winds prevailed on the dates mentioned, which seriously blighted growing crops. However, the warning of these conditions is not generally of great benefit, as it is impossible to protect against them. In some irrigated sections an extra amount of water is run upon the land in advance of such periods, the evaporation of which tends to reduce the amount of injury.

FORECASTS IN OREGON.

Mr. B. S. Pague, local forecast official in charge of the Portland, Oreg., forecast district, reports as follows in regard to the forecasts and warnings issued from that station:

During the month no wind signal orders were issued, there being no storms.

The fishing season has opened. There are some 3,000 persons in fishing boats at the mouth of the Columbia River every day. The knowledge that there are no wind signal orders displayed is as valuable as the orders themselves would be. The cannery men, who employ the fishermen, carefully note the forecasts day by day.

Frost forecasts were issued and verified on several dates, but no benefits have been reported.

Rain forecasts are anxiously looked for, owing to the long absence of good general rains.

The temperature forecasts have been watched with considerable interest, owing to the effect the temperature now has on the snow in the mountains, the consequent melting, and the rise of the rivers and streams.

Special forecast information has been asked for and given quite frequently during the month concerning probable rain and the rise of the Columbia. Many people sow seeds, etc., along the river bottom on information issued from this office. One orchardist reported personally that he has found it most profitable and for the best interests of his orchard not to plow until the weather report states that "summer weather conditions" are present.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month 8 high areas and 7 low areas were sufficiently well defined to be traced on Charts I and II. The accompanying table gives the more important statistics regarding the beginning and advance of these highs and lows. These conditions during the month were remarkable for their definitions, duration, and distance over which it was possible to follow them. The average duration for both was 6.5 days. The average length of path was 3,825 and 3,887 miles for highs and lows, respectively.

HIGHS.

Of the 7 highs all but No. I began on the Pacific Coast and all were traced across the country to the Atlantic Coast. Nos. V and VII disappeared off the north Atlantic Coast and the others near the Florida coast.

LOWS.

Of the lows I and VII were first noted in Arizona, II and III near the north Pacific Coast, and IV and V in Alberta. No. VII was last noted in the St. Lawrence Valley, No. V off the middle Atlantic Coast, and all the rest over or near Newfoundland. As low I passed up the Atlantic Coast, a wind of 48 miles an hour was reported at Block Island, p. m. of 5th. Buffalo reported a 56-mile wind, p. m. of 20th, as low No. IV reached the lower Lake Region. The highest wind of the month, 72 miles an hour, was reported from Block Island, p. m. of 28th, as low VI moved up the Atlantic Coast. Many of the highs, and especially the lows, afforded a fair opportunity to study upper and lower cloud motion at or near their centers. In the case of lows the lower clouds in front almost invariably took the direction of the wind or toward the center. The upper clouds on the other hand, when the low moved almost due south, were moving either due east or toward northeast at right angles to the trajectory. The conclusion was rather strong, especially in the case of low VI, that the cause of motion in no case could be the general drift of the atmosphere either in the lower or in the higher layers. It would seem as though in all cases where there are well defined lows moving nearly south or southeast the motion of lower and upper clouds ought to furnish a criterion as to the motion being due to that of any atmospheric strata.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a.m.	50	106	4, a.m.	39	74	2,370	3.0	790	32.9
II	1, p.m.	47	129	9, p.m.	26	78	3,750	8.0	469	17.9
III	6, p.m.	36	124	12, p.m.	31	81	3,330	6.0	555	23.1
IV	10, a.m.	44	125	18, a.m.	32	79	4,140	8.0	517	21.5
V	13, p.m.	48	127	20, a.m.	44	65	3,360	6.5	517	21.5
VI	16, p.m.	42	126	21, p.m.	31	78	3,390	5.0	678	28.2
VII	20, a.m.	33	119	29, a.m.	48	56	5,220	9.0	580	24.2
VIII	26, a.m.	42	127	2, p.m.*	27	85	5,040	6.5	775	32.3
Total							30,600	52.0	4,881	
Mean of 8 tracks							3,825	6.5	610	25.2
Mean of 52 days									588	24.5
Low areas.										
I	1, a.m.	32	116	6, p.m.	47	57	3,870	5.5	704	29.3
II	4, p.m.	47	126	11, a.m.	37	78	3,390	6.5	522	21.7
III	9, a.m.	50	123	17, a.m.	49	60	4,920	8.0	615	25.6
IV	13, a.m.	55	113	22, a.m.	50	60	4,800	9.0	533	22.2
V	20, a.m.	53	118	25, a.m.	40	69	3,870	5.0	774	32.3
VI	24, p.m.	46	96	30, p.m.	46	58	3,300	6.0	550	22.9
VII	28, a.m.	34	113	3, p.m.*	46	77	3,060	5.5	556	23.2
Total							27,210	45.5	4,254	
Mean of 7 tracks							3,887	6.5	608	25.3
Mean of 45.5 days									598	24.9

*May.

THE WEATHER OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The statistical aspect of the weather of the month is presented in the tables which form the closing part of this REVIEW. Table I in particular contains a variety of details from which the reader may select those most interesting to himself. The numerical values in the tables have been generalized in a number of cases, the results appearing on Charts Nos. III to VIII, inclusive.

PRESSURE AND WIND.

Normal conditions.—The geographic distribution of normal barometric readings at sea level and under local gravity for April is shown by Chart VI of the MONTHLY WEATHER REVIEW for April, 1893.

In April there is usually a decrease of pressure over the United States and Canada, except along the north Pacific